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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/562,124	12/23/2005	Kenichi Fukuoka	28955.1070	6278

27890 7590 06/26/2008

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EXAMINER	
WILSON, MICHAEL H	
ART UNIT	PAPER NUMBER
1794	
MAIL DATE	DELIVERY MODE
06/26/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/562,124	FUKUOKA ET AL.	
	Examiner	Art Unit	
	MICHAEL WILSON	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *1-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 December 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *20051223*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 14 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 14, "an area larger than the area of an emitting region formed of an overlap between the cathode and the anode" is unclear. It is unclear if the "area" being referred to is the area of an emitting layer, the area of several layers together, or the entire area between the anode and cathode. For the purpose of this action "an area larger than the area of an emitting region formed of an overlap between the cathode and the anode" is interpreted to read -- an area larger than the area of an emitting layer--. Appropriate correction is required.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-5, 7, 9, 18-22, 24, 26 and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Tanaka et al. (US 6,107,734).

Regarding claims 1 and 24, Tanaka et al. disclose an organic electroluminescent device comprising:

- at least two or more emitting layers between an anode and a cathode (column 2, lines 53-54);
- and an intermediate electrode layer being interposed between emitting layers (column 2, lines 56-60);
    - the intermediate electrode layer being a single layer or a multilayer structure of a plurality of layers (column 7, lines 42-67);
    - at least one of the layers comprising a semiconductive material having a resistivity of 0.001 to 10,000 Ω·cm.

Regarding the resistivity limitations of claims 1 and 24, while Tanaka et al. does not explicitly disclose the resistivity of the semiconducting materials, the materials are the same as those disclosed by applicant as having the claimed resistivity. Therefore, the resistivity of semiconducting materials would be expected inherently to have the same properties as disclosed by applicant. Recitation of a newly disclosed property does not distinguish over a reference disclosure of the article or composition claims. *General Electric v. Jewe Incandescent Lamp Co.*, 67 USPQ 155. *Titanium Metal Corp.*

v. Banner, 227 USPQ 773. Applicant bears responsibility for proving that reference composition does not possess the characteristics recited in the claims. In *re Fritzgerald*, 205 USPQ 597, In *re Best*, 195 USPQ 430.

Regarding claims 2-5, Tanaka et al. disclose all the claim limitations as set forth above. Additionally the reference discloses:

- wherein the semiconductive material is a chalcogenide, such as ZnS, CdS, ZnSe, and ZnSSe (column 8, lines 31-33);
- wherein the semiconductive material comprises a chalcogenide (column 8, lines 31-33) and an alkali metal (column 8, lines 6-8, and 19-20);
- wherein the semiconductive material is a conductive oxide, such as In-Zn-O oxide (a material containing zinc oxide), or CuO (column 8, lines 9-12 and 29);
- wherein the conductive oxide contains a transition metal, such as CuO (column 8, line 29).

Regarding claim 7, Tanaka et al. disclose all the claim limitations as set forth above. Additionally the reference discloses wherein the semiconductive material comprises an acceptor that is a conductive oxide containing a transition metal, CuO, (column 8, lines 12 and 29), and a donor that is an alkali metal and/or an alkaline earth metal column 8, lines 6-8 and 19-20).

Regarding claim 9, Tanaka et al. disclose all the claim limitations as set forth above. Additionally the reference discloses wherein the semiconductive material is Li:Alq [tris(8-hydroxyquinoline)aluminum(III)], a conductive organic radical salt represented by the following instant formula (1): D_yA_z (column 9, lines 60-67). Li is a

donor atom and Alq is the acceptor compound. The reference further discloses the layer may by a mix of an alkali metal (donor) and a carbon compound (donor) (column 7, lines 53-54).

Regarding claim 18, Tanaka et al. disclose an organic electroluminescent device comprising:

- one or more emitting layers between an anode and a cathode (column 2, lines 56-59);
- and bipolar charge injection layers being interposed between the anode (column 7, lines 42-67);
- and at least one of the emitting layers and between the cathode and at least one of the emitting layers (column 2, lines 56-59).

Regarding claims 19-22, Tanaka et al. disclose all the claim limitations as set forth above. Additionally the reference discloses:

- wherein the bipolar charge injection layers comprise at least one donor and at least one acceptor (column 7, line 42 to column 8, line 8).
- wherein the acceptor is an oxide of a transition metal, such as CuO (column 8, line29);
- wherein the donor is an alkali metal and/or an alkaline earth metal (column 8, lines 19-20).
- wherein the bipolar charge injection layers comprise a mixture of at least one element single substance selected from the group of Cs, Li, Na and K (column 8, lines 4-5); and CuO (column 8, line 29).

Regarding claim 26, Tanaka et al. disclose all the claim limitations as set forth above. Additionally the reference discloses wherein the intermediate electrode layer is a bipolar charge injection layer (column 7, line 41 to column 8, line 8). Additionally the intermediate conductive layer must perform the function of supplying holes to one emissive layer and electrons to the emissive layer on the opposite side of the intermediate conductive layer, which is the function of a bipolar charge injection layer, in order for the device of Tanaka et al. to work.

Regarding claim 28, Tanaka et al. disclose all the claim limitations as set forth above. Additionally the reference discloses wherein the device is comprised in a display device, such as an SVGA screen of over 12 inches (column 3, lines 42-48).

3. Claims 13, 17, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Parthasarathy et al. (US 6,420,031 B1).

Regarding claim 13, Parthasarathy et al. discloses an organic electroluminescent device comprising:

- one or more emitting layers between an anode and a cathode (column 4 lines 14-18; column 10, lines 47-54; and figure 2a);

- the cathode comprises at least one metal oxide (column 9, lines 42-47);

- and the cathode has a light transmittance of 80% or more (column 4, lines 1-2).

Regarding claim 17, Parthasarathy et al. disclose all the claim limitations as set forth above. Additionally the reference discloses wherein the cathode has a donor layer

of copper phthalocyanine or zinc phthalocyanine which is about 10% of the cathode (cathode comprises electron injection and ITO layers, column 19, lines 54-57).

Regarding claim 25, Parthasarathy et al. disclose an organic electroluminescent device comprising:

- at least one or more emitting layers between an anode and a cathode (column 15, lines 47-67, and figure 2b);
- the cathode comprises at least one donor (column 10, lines 19-20);
- and at least one acceptor comprising a metal oxide (column 10, lines 17-18);
- and the cathode having a transmittance of at least 80% (column 9, lines 34-36).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (US 6,107,734) as applied to claim 1 above and in view of Mori (US 6,215,245 B1).

Regarding claim 6, Tanaka et al. disclose all the claim limitations as set forth above. Additionally the reference discloses that the semiconducting material may be a conductive oxide contains a transition metal, such as CuO (column 8, line 29). The reference also discloses that electrode material and compounds with electron injection ability may be used in the intermediate layer (column 7, lines 48, 49-50; column 8, lines 7-8). However the reference does not explicitly disclose IrO2, Mo2, Nb2, Os2, ReO2, or ReO3 as suitable material.

Mori teaches a similar electroluminescent device with a cathode that has improved interfacial cohesion and electron injection efficiency (column 1, line 67 to column 2, line 2). The reference teaches IrO2, Mo2, Nb2, Os2, ReO2, or ReO3 are suitable compounds for use in the cathode (column 3, lines 50-52).

It would be obvious to one of ordinary skill in the art at the time of the invention to combine the transition metal oxides of Mori with the device of Tanaka et al. One of ordinary skill would reasonably expect success because Mori teaches the compounds as suitable for cathodes and teaches the compounds to stabilize alkali metals in a cathode (column 3, lines 29-32).One of ordinary skill in the art would be motivated by a desire to improve interfacial cohesion and electron injection efficiency (column 1, line 67 to column 2, line 2).

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (US 6,107,734) as applied to claim 1 above and in view of Kido (US 2003/0189401 A1).

Regarding claim 8, Tanaka et al. disclose all the claim limitations as set forth above. Additionally the reference discloses wherein the semiconductive material comprises an acceptor that is a conductive oxide containing a transition metal, CuO, (column 8, lines 12 and 29), and a donor that is an alkali metal, such as Li (column 9, lines 60-64), and/or an alkaline earth metal column 8, lines 6-8 and 19-20). However the reference does not explicitly disclose other acceptor-donor charge transfer complexes, such as $Li_xV_2O_5$.

Kido et al. teach an electroluminescent device with V2O5 as an acceptor compound [0317] in a layered electrode [0313].

It would be obvious to one of ordinary skill in the art at the time of the invention to use V2O5 of Kido et al. as an acceptor compound in the cathode of Tanaka et al. One of ordinary skill would reasonably expect success given the disclosure of Kido et al. that V2O5 is an electron accepting compound suitable for use in a cathode. The complex $Li_xV_2O_5$ would automatically form in a layer containing both compounds because lithium is a very strong electron donor and V2O5 is an electron acceptor. One of ordinary skill in the art would be motivated by a desire to achieve a long operational life time with a high luminance [0025].

8. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (US 6,107,734) as applied to claim 22 above.

Regarding claim 23, Tanaka et al. disclose all the claim limitations as set forth above. Additionally the reference discloses wherein the content of the element (Li) is 1.5% (column 9, lines 60-64), but does not explicitly disclose a range for the wt% of the element content.

Although the reference does not disclose a wt% of 2 to 20%, it is the examiner's position that the values are close enough that one of ordinary skill in the art would have expected the same properties. Case law holds that a prima facie case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. Case law holds that a prima facie case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985).

In light of the case law cited above and given that there is only a "slight" difference between the amount of Li (the element) disclosed by Tanaka et al. and the amount disclosed in the present claims and further given the fact that no criticality is disclosed in the present invention with respect to the amount of Li (the element), it therefore would have been obvious to one of ordinary skill in the art that the amount of Li (the element) disclosed in the present claims is but an obvious variant of the amounts

disclosed in Tanaka et al., and thereby one of ordinary skill in the art would have arrived at the claimed invention.

9. Claims 9-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (US 6,107,734) as applied to claim 1 above and in view of Liao et al. (US 2003/0170491 A1).

Regarding claims 10 and 11, Tanaka et al. disclose all the claim limitations as set forth above. Additionally the reference discloses wherein the semiconductive material is Li:Alq [tris(8-hydroxyquinoline)aluminum(III)], a conductive organic radical salt represented by the following instant formula (1): D_yA_z (column 9, lines 60-67). Li is a donor atom and Alq is the acceptor compound. The reference further discloses the layer may by a mix of an alkali metal (donor) and a carbon compound (donor) (column 7, lines 52-53). However the reference does not explicitly disclose other conductive organic radical salts.

Liao et al. teach a similar organic electroluminescent device with multiple emissive layers (abstract). The reference teaches that bis-(ethylenedithio)-tetrafulvalene (BEDT-TTF) and tetrafulvalene (TTF) are n-type dopants with strong electron-donating properties [0063]. The reference also teaches that 2,3,5,6-tetrafluoro-7,7,8,8-tetracyanoquinodimethane (F4-TCNQ) and other derivatives of TCNQ are p-type dopants with strong electron-withdrawing properties [0063].

It would be obvious to one of ordinary skill in the art at the time of the invention to use the p and n type materials of Liao et al. in the device of Tanaka et al. One of

ordinary skill in the art would recognize that the p and n type materials of Liao et al. would be suitable for the device of Tanaka et al. given that both references teach similar organic electroluminescent devices and teach p and n type materials used in similar layers, positioned between emissive layers, and perform the same function. One of ordinary skill in the art would be motivated by a desire to increase brightness [0028], lifetime [0029], and lower driving voltage [0030] as taught by Liao et al.

Regarding claim 12, modified Tanaka et al. discloses all the claim limitations as set forth above. Additionally the reference discloses alkali and alkaline earth metals as preferable electron injection compounds (column 8, lines 19-21), which would act as donor compounds. The reference also discloses Li as the donor compound in an intermediate conductive layer (column 9, lines 60-67).

10. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka et al. (US 6,107,734) as applied to claim 1 above and in view of Forrest et al. (US 5,703,436).

Regarding claim 27, Tanaka et al disclose all the claim limitations as set forth above. However the reference does not explicitly disclose that the cathode and bipolar charge injection layers are the same.

Forrest et al. teach a similar electroluminescent device where the cathode and intermediate electrodes (or bipolar charge injection layers) are the same (column 4, line 49 to column 5, line 14; and figure 2c).

It would be obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Forrest et al. with the device of Tanaka et al. One of ordinary skill would reasonably expect success given that both references disclose similar devices with multiple emitting layers separated by connecting layers. One of ordinary skill would be motivated by a desire to simplify the device for easier manufacturing.

11. Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Parthasarathy et al. (US 6,420,031 B1) as applied to claim 1 above and in view of Okada et al. (US 6,143,434).

Regarding claims 14-16, Parthasarathy et al. disclose all the claim limitations as set forth above. However the reference does not explicitly disclose a sealing film.

Okada et al. teach an electroluminescent device with a protective layer (sealing film) (column 26, line 39). The protective layer protects the device from any substance which will accelerate deterioration such as water or oxygen (column 29, lines 38-41). The reference teaches metal oxides such as MgO, SiO, SiO2, GeO, NiO, and TiO2 are suitable for the protective layer (column 30, lines 1-2). While the reference does not explicitly teach the positioning of the layer it would be obvious to one or ordinary skill in the art at the time of the invention to place the protective layer over the cathode in order to protect the cathode and the rest of the device from deterioration. The reference also does not explicitly teach the materials as transparent. However, it would be obvious to one of ordinary skill in the art at the time of the invention to use transparent material for the protective layer in order to maximize the light emitted from the device. Additionally

the metal oxides taught by Okada et al. being the same as those disclosed by applicant as being transparent, the material of Okada et al. would be expected to inherently posses the same properties, meeting the claimed limitation.

It would be obvious to one of ordinary skill in the art at the time of the invention to use the protective layer of Okada et al. in the device of Parthasarathy et al. in order to protect the device from water and oxygen [0158]. It would also be obvious to make the protective layer to cover a larger area than the emitting layer, for example encapsulating the device, in order to protect more effectively protect the device from oxygen and moisture.

12. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liao et al. (US 6,717,358 B1).

Regarding claim 25, Liao et al. disclose an organic electroluminescent device comprising at least one or more emitting layers between an anode and a cathode (column 2, lines 33-40). The multilayered cathode comprises at least one donor (column 7, line 60 to column 8, line 15) and at least one acceptor comprising a metal oxide (column 9, lines 7-13). The reference also discloses a light transmittance of at least 90% for the interfacial layer (column 6. line 64-65), but does not explicitly disclose the % transmittance of the entire cathode.

However the materials composing the rest of the cathode are the same as those where are claimed by applicant to posses the needed transmittance. The reference also teaches that the thickness of the cathodes layers may be can be optimized to yield

to maximum transmission (column 14, lines 15-18). Therefore it is the examiners position that it would be obvious to one of ordinary skill at the time of the invention to optimize the thickness of the layers in the cathode of Liao et al. by routine experimentation in order to obtain a cathode with at least 80% transmittance.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Nakada et al, “Multi photon emission organic devices using charge-transfer complex as charge generation layer" discloses with TCNQ in a connecting layer between emitting layers but does not disclose metal oxides for use in the layer.
- Fukase et al. “Top emitting organic EL devices having ITO cathode” discloses Cs and BCP in a connecting layer between emitting layers but does not disclose metal oxides for use in the layer.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL WILSON whose telephone number is (571) 270-3882. The examiner can normally be reached on Monday-Thursday, 7:30-5:00PM EST, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Callie Shosho can be reached on (571) 272-1123. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

15. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MHW

/Callie E. Shosho/
Supervisory Patent Examiner, Art Unit 1794